This program calculates the Gabor-Wigner transform based on the FFT-based method.

Packages

see requirements.txt

Usage

$$\mathrm{y} = \mathrm{GW}(\mathrm{x}, \mathrm{t}, \mathrm{f}, \mathrm{B}, \mathrm{sgm}, \mathrm{a}, \mathrm{b})$$

x: input signal

t: time-axis

f: frequency-axis

B: bandwidth of the window function used in the Gabor transform

sgm: control the width of the gaussian window used in the Gabor transform

a: magnification of the Gabor transform

b: magnification of the Wigner transform

y: output the Gabor-Wigner transform $G^a W^b$

Set your inputs in the input.py. Please note that the inputs must satisfy the below constraints.

a. $\mathrm{dt} * \mathrm{df} = \frac{1}{2\mathrm{N}}$ where N is an integer.

b. $2\mathrm{N} \geq 2\frac{\mathrm{B}}{\mathrm{dt}} + 1.$

c. $\mathrm{N} \geq \mathrm{T}$ where T is the size of x.

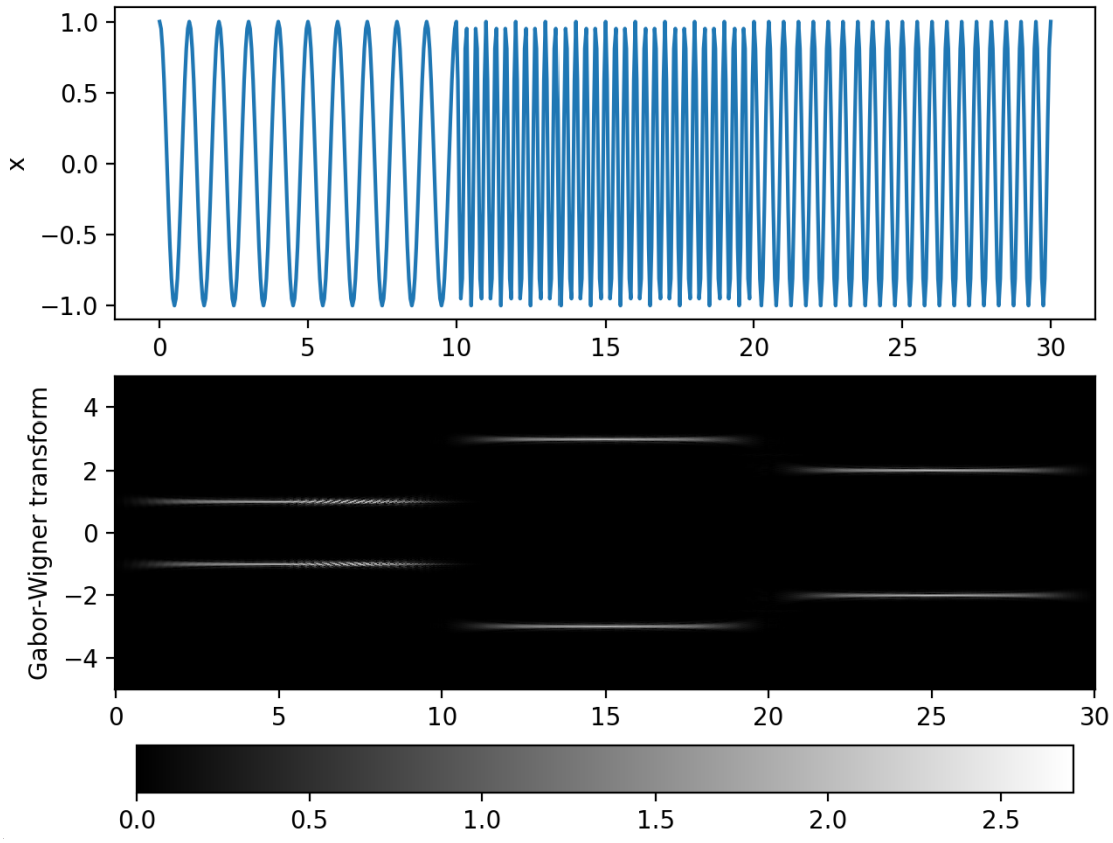
Run main.py to get the result.

Example

Input

```
dt = 0.05
df = 0.01
t1 = np.linspace(0.0, 9.95, 200)
t2 = np.linspace(10.0, 19.95, 200)
t3 = np.linspace(20.0, 30.0, 201)
t = np.linspace(0.0, 30.0, 601)
x1 = np.cos(2 * np.pi * t1)
x2 = np.cos(6 * np.pi * t2)
x3 = np.cos(4 * np.pi * t3)
x = np.concatenate((x1, x2, x3), axis = None)
f = np.linspace(-5.0, 5.0, 1001)
B = 2.5
sgm = 0.1
a = 2.6
b = 0.7
```

Output


x
1.0
0.5
0.0
−0.5
−1.0
0
5
10
15
20
25
30
Gabor-Wigner transform
4
2
0
−2
−4
0
5
10
15
20
25
30
0.0
0.5
1.0
1.5
2.0
2.5